

UMC software, P, E and R resolutions and $K_{\pi 2\gamma}$, K_{e4} background study

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Update of UMC software (1)

- Latest UMC software is checked out from CVS. Running well in Tsinghua and Triumf.
- UMC based acceptances of $K_{\pi 2}$ and pnn are compared with E949 pnn1 analysis.
- $K_{\pi 2\gamma}$ generator is integrated into UMC.

Update of UMC software (2)

- Experimental model of π^- annihilation (K_{e4}) in target is integrated into UMC.
- Pass2 software are upgraded, umc truth information is correctly unpacked.
- Three big UMC samples (K_{e4} and CEX (e or μ)) are generated and processed.

Update of UMC software (3)

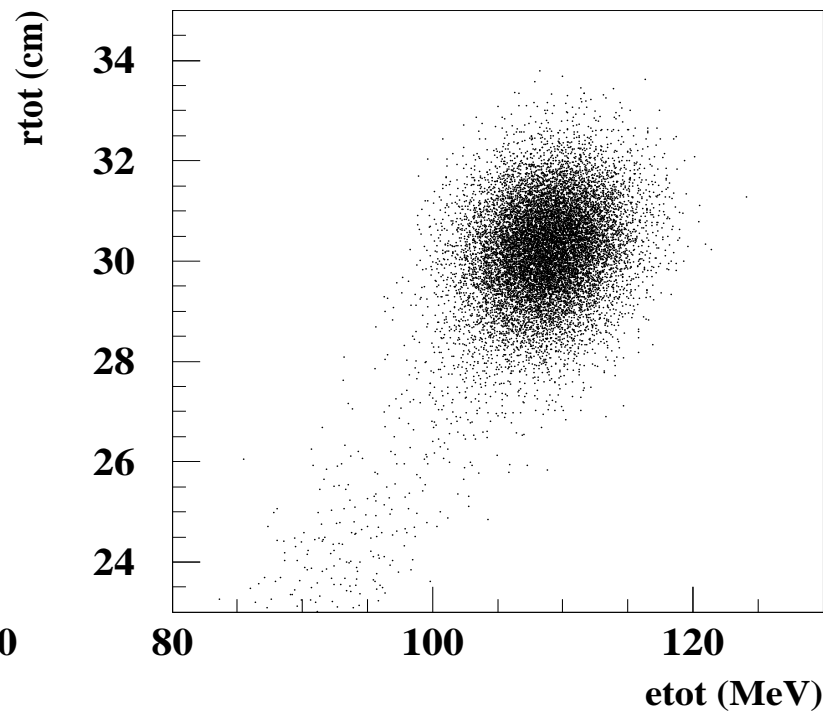
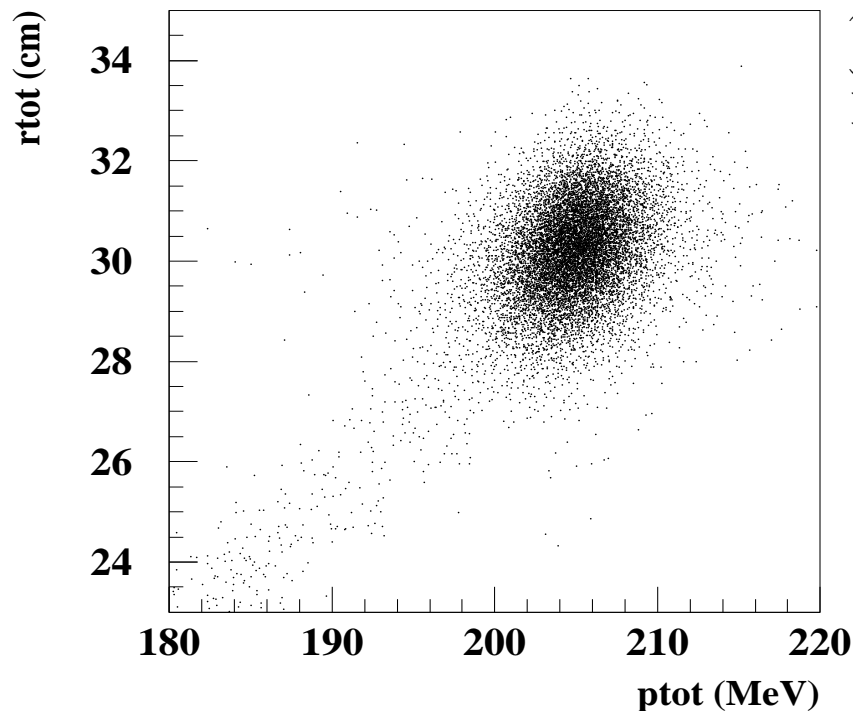
mode: process_trigger_comment

mode	number	mode	number
pnn_pnn12_nidif	99999	ke4_mc1	4.4×10^7
pnn_pnn12_nonidif	100000	ke4_mc2	1×10^7
pnn_pnn1_nidif	100000	ke4_mc3	2×10^8
pnn_pnn1_nonidif	100000	cex_e	3.8×10^8 ($40N_{KB}$)
kp2_kp2	99993	cex_mu	3.42×10^8 ($52N_{KB}$)
kp2g_pnn2_ib	499968		
kp2g_pnn2_de	1000		
kp2_pnn2_no_pv	199992		

P, E and R resolution in pnn2 analysis (1)

Setup cuts:

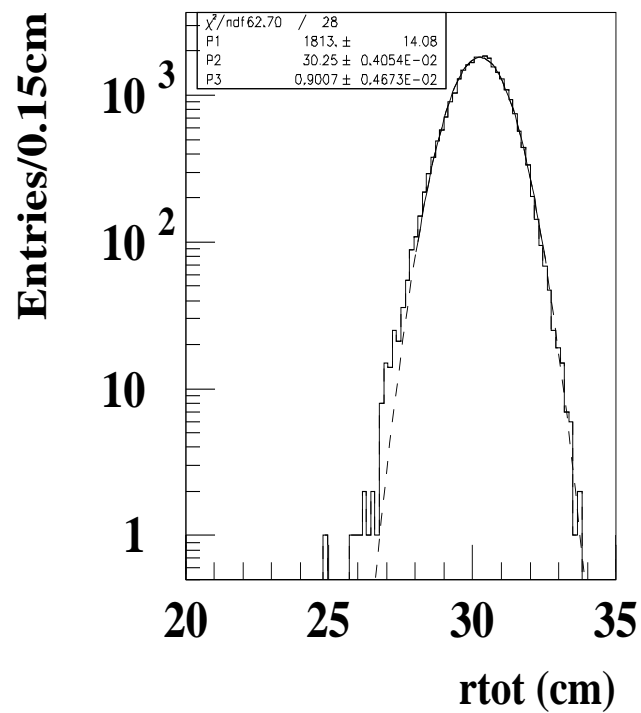
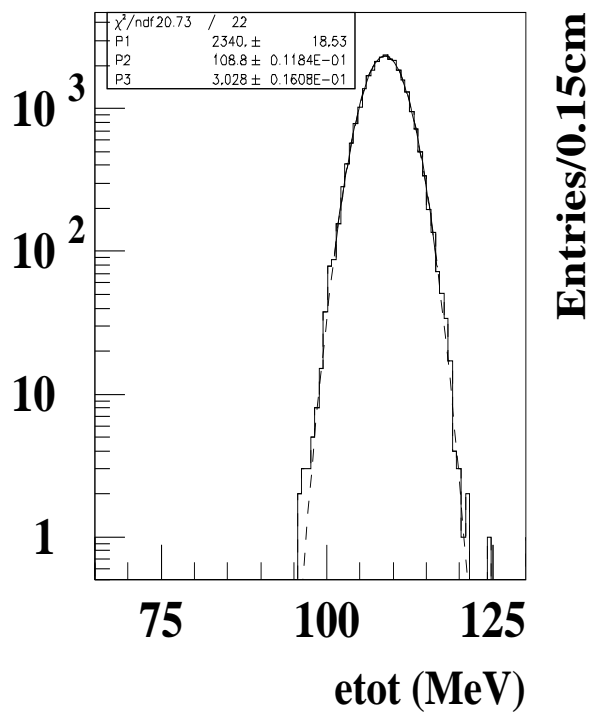
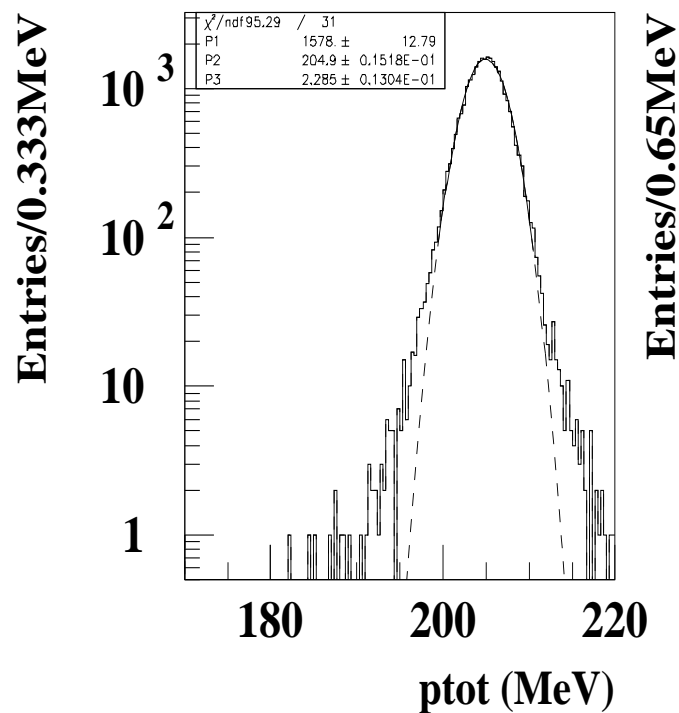
- The majority of pass2 analysis cuts
- Inverted TGPVCUT
- Inverted loose PVCUTS



P, E and R resolution in pnn2 analysis (2)

P, E and R fitting (2.5σ symmetric gauss fit)

When fitting one variable, 3σ cuts are applied on the other two ones.



P, E and R resolution in pnn2 analysis (3)

Fitting result

	this analysis	truth & e949, pnn1
$ptot$ (MeV)	$204.94 \pm 0.02 \pm 0.02$	205.1
σ_{ptot}	$2.29 \pm 0.01^{+0.0}_{-0.04}$	2.299 ± 0.006
$etot$ (MeV)	$108.77 \pm 0.01 \pm 0.01$	108.6
σ_{etot}	$3.03 \pm 0.02 \pm 0.02$	2.976 ± 0.005
$rtot$ (cm)	$30.254 \pm 0.004 \pm 0.010$	30.4
σ_{rtot}	$0.901 \pm 0.005 \pm 0.002$	0.866 ± 0.002

P, E and R resolution in pnn2 analysis (4)

- Improved resolutions than E787
- Expand pnn2 box while keep the same deviation from $K_{\pi 2}$ peak
- Gain 22% increment of acceptance of phase space cut (UMC)

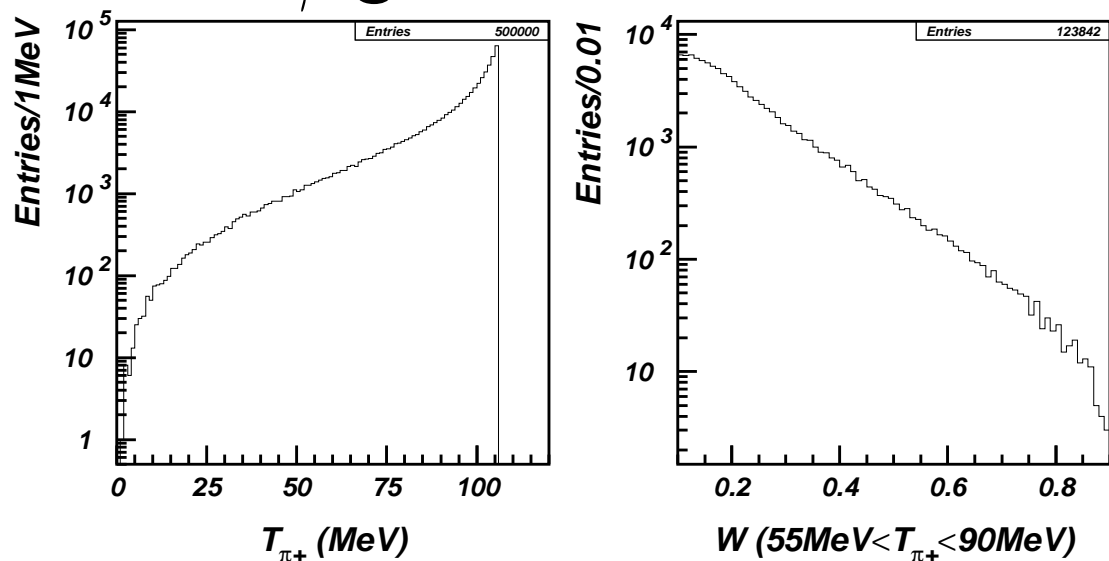
	dev	old box (E787)	suggestion of this study	suggestion from David
$ptot$ (MeV)	2.5	(140, 195)	(140, 199.2)	(140, 199)
$etot$ (MeV)	2.5	(60, 95)	(60, 101.2)	(60, 100.5)
$rtot$ (cm)	2.75	(12, 27)	(12, 27.8)	(12, 28)

$K_{\pi 2\gamma}$ background study (1)

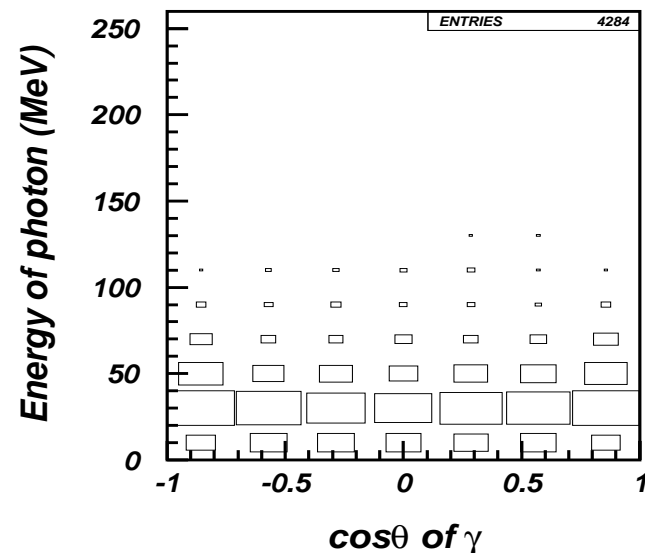
- $N_{K\pi 2\gamma} = \frac{N_{K\pi 2 \text{ peak}}}{\kappa \times R_\gamma}$
- $N_{K\pi 2 \text{ peak}}$: $K_{\pi 2}$ peak events surviving all pass2 cuts (data)
- κ : a ratio of $K_{\pi 2}$ over $K_{\pi 2\gamma}$ after all pass2 cut except $PVCUT$ (MC)
- R_γ = single photon rejection

$K_{\pi 2\gamma}$ background study (2)

$K_{\pi 2\gamma}$ generator, ib



$\cos 3d$ and energy distribution of gamma after offline cut



$K_{\pi 2\gamma}$ background study (3)

	small pnn2 box	large pnn2 box
κ	551	342
R_γ	10.43	5.40

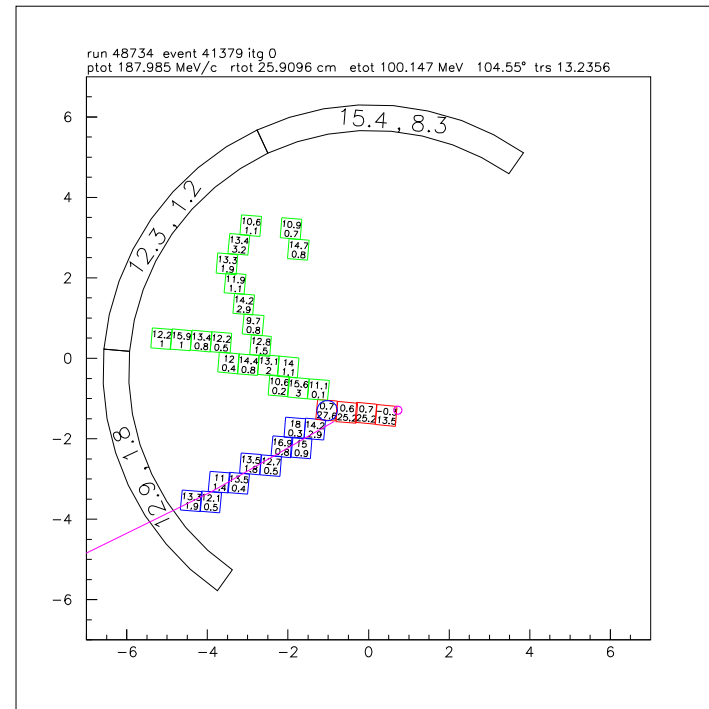
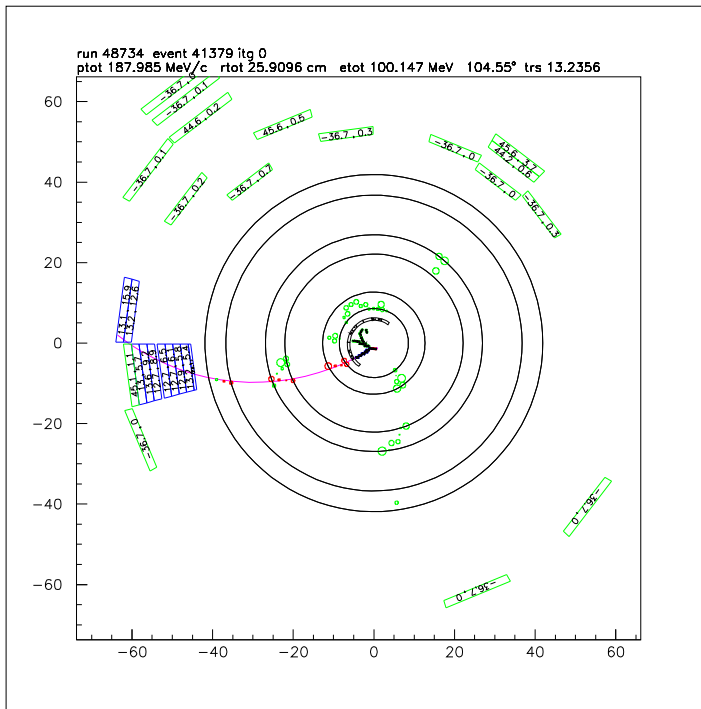
The size of signal box plays the main role in κ and R_γ estimation.

Ongoing K_{e4} background study (1)

- $K_{e4} : K^+ \rightarrow \pi^+ \pi^- e^+ \nu_e$, when $T_{\pi^- e^+}$ is very low, it can be a background
- TGPVCUT, CCDPUL and OPSVETO are effective cuts
- Using data and MC to estimate this background

Ongoing K_{e4} background study (2)

- Normalization branch from data (preliminary)
Inversed loose TGPVCUT with all the others
pass2 cuts



Ongoing K_{e4} background study (3)

Plan for the following month

- Correct normalization branch from data
- Rejection of cuts TGPVCUT for different E_{hide} from UMC

Summary

- UMC is in good mood.
- P, E and R resolutions are measured for pnn2 data.
- $K_{\pi\gamma}$ is almost done.
- Wish K_{e4} study can be finished as soon as possible.